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SOFT CANDY AND ITS MANUFACTURING METHOD
[SOFUTO KYANDEI OYOBI SONO SEIHO]

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[Scope of Claims]

[Claim 1] A soft candy composed of a powder ingredient containing crystalline sugars, amorphous sugars, a thickening agent, and a binding control agent, specifically a soft candy wherein the particles of the powder ingredient, while being slightly melted on the surface, are dispersed in a continuous layer containing the thickening agent and the binding control agent.

[Claim 2] A method for manufacturing soft candy wherein a powder ingredient containing crystalline sugars is mixed with a binding control agent, amorphous sugars and a thickening agent are added to the mixture, its moisture content is adjusted to 3 to 13 weight %, and the particles of the powder ingredient are slightly melted on the surface.

[Detailed Description of the Invention]

[0001]

[Industrial Field of Application] The present invention pertains to a soft candy manufactured without heating and its manufacturing process, more specifically, a soft candy superior in moldability and stable in crystalline state despite being subjected to no heating, and a method for manufacturing such soft candy at high speed.

[0002]

[Prior Art] Candies as a type of sugar confectionery vary in types according to the ingredient composition and boiling temperature, and so do their classification methods. For example, they are classified into hard candy and soft candy according to the texture. A soft candy is defined by the Japan Agricultural Standards as follows. That is, a soft candy is a candy that uses candy dough boiled down to contain 6 to 20 weight % (% hereafter) of moisture, featuring a soft texture; for example, caramel, nougat, etc. Traditionally, a soft candy is made of crystalline sugars such as sugar, sugar alcohol, etc., water needed to dissolve these sugars, and amorphous sugars such as starch syrup, etc. as major ingredients; starches, fats, etc. are added as needed; the mixture is heated and dissolved, boiled to evaporate the excess moisture, and cooled; a thickening agent, aroma chemicals, etc., are added, and saccharization promoting dough (fondant, powder sugar, etc.) is added as needed; and the resulting product is matured (crystal stabilization). This conventional method for manufacturing soft candy, involving these multiple steps, is lengthy, and is unable to continuously produce products having uniform properties due to varied moisture content under different heating conditions and varied crystalline status under different maturing conditions, often resulting in products inferior in durability in storage. Furthermore, the method

requires a process step to boil down the ingredients at high temperature (approximately 100°C or more) to render stickiness and softness specific to soft candy, making it difficult to add heat sensitive ingredients such as water soluble aroma chemicals, fruit juices, water soluble vitamins, etc.

[0003] Thus, methods to manufacture soft candy under non heating conditions have been studied; an example is “candy clay,” which was disclosed in Japanese Patent No. 57-166936. The “candy clay” is made out of dough having a marzipan like plasticity, which is a mixture of shortening, powder sugar, and syrup (corn syrup, etc.), and is molded into any desirable shape and dried. However, the “candy clay” has poor resistance to mechanical forces such as rolling, stretch, compression, etc., although it is elastic and moldable enough to be hand molded. As a result, in industrial production, mechanical molding of the clay is difficult, or the forms the clay can be molded to are limited, making continuous production impossible. Also, the “candy clay” in typical packaging dries up over time, and loses its viscoelasticity, resulting in cracks and discoloring, and compromising the product value.

[0004]

[Problems to Be Solved by the Invention] The present invention intends to solve these problems, offering a soft candy featuring moldability and stability equal to a soft candy confected by

heating despite being subjected to no heating and maintaining its properties over time, and a method for manufacturing such soft candy continuously while insuring the uniform product quality.

[0005]

[Means of Solving the Problems] The objective above is achieved by a soft candy composed of a powder ingredient containing crystalline sugars, amorphous sugars, a thickening agent, and a binding control agent, specifically a soft candy wherein the particles of the powder ingredient, while being slightly melted on the surface, are dispersed in a continuous layer containing the thickening agent and the binding control agent, and a method for manufacturing soft candy wherein a powder ingredient containing crystalline sugars is mixed with a binding control agent, amorphous sugars and a thickening agent are added to the mixture, its moisture content is adjusted to 3 to 13 weight %, and the particles of the powder ingredient are slightly melted on the surface.

[0006] That is, the inventors studied the composition and the method that achieve without heating the moldability and viscoelasticity equal to a soft candy subjected to heating. As a result, the inventors discovered that a soft candy having an appropriate level of viscoelasticity and being superior in crystalline status and moldability was continuously obtained by

a method wherein a powder ingredient containing crystalline sugars is mixed with amorphous sugars, a thickening agent and a binding control agent are added to the mixture under the presence of water without heating, and the particles of the powder ingredient, while being slightly melted, are dispersed in a continuous layer made of the thickening agent and the binding control agent. Next, the present invention will be described in detail.

[0007] The present invention uses a powder ingredient containing crystalline sugars. Crystalline sugars may be selected from: for example, sugars (superfine sugar, pulverized granulated sugar, etc.), monosaccharides (glucose sugar, fruit sugar, etc.), polysaccharides having at least two monosaccharides (lactose, maltose, xylose, isomerized lactose, etc.), sugar alcohols (sorbitol, maltitol, mannitol, reducing palatinose, xylitol, reducing lactose, erythritol, etc.), oligosaccharides, derivatives of sugar (palatinose, etc.), etc. Among these, sugar and maltose are especially desirable in terms of binding of

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sugar particles, properties over time, stability, flavor, etc. Also, sugar alcohol is desirable to improve the moldability when the moisture content or the ratio of other ingredients is low, or to finish a soft candy softer and moister. Further, the content of crystalline sugars is 20 to 80% of the total weight

of soft candy in solid content conversion, or more desirably 35 to 70%. If the content is less than 20%, the soft candy dough absorbs an excess amount of moisture when it is mixed with amorphous sugars, thickening agent, etc., which will be described later; this results in a stickier candy with poor moldability and durability over time. If the content exceeds 80%, the moisture is likely to disperse in transit and storage, resulting in a dry, flavorless soft candy.

[0008] In addition to the crystalline sugars above, the powder ingredient may be optionally selected as needed from: for example, starches (starch, processed starch, modified starch, decomposed starch, etc.), calcium, dairy products, flavor enhancers in the powder form (tea powder, egg white powder, egg yolk powder, seasoning, fruit juice powder, essence powder, high intensity sweeteners such as saccharine, stevia, aspartame, etc.), aroma chemicals, acidulants, stabilizing agents, salts, and coloring agents, as well as various nutrients in the powder form (fiber, vitamins, calcium, iron, etc.) and various functional substances (DHA, EPA, bifidus growth stimulator, etc.) in the powder form. Starches are especially desirable in terms of durability over time. Since the soft candy according to the present invention is manufactured without heating, its quality, flavor, and nutritious values are not spoiled if heat sensitive fruit juices, vitamins, etc., are used. Other

materials that are subject to physical change when heated and therefore is not used for soft candy can be used in a variety of compositions.

[0009] Next, the amorphous sugars may be selected from: for example, starch syrup, reducing starch syrup, coupling sugar, etc. It is especially desirable to combine low DE (Dextrose Equivalent; DE represents the ratio of the direct reducing sugar in solid) starch syrup (desirably DE=7.8 to 45, or more desirably 7.8 to 28.3) and reducing starch syrup high in molecular weight and viscosity, enhancing the moldability, and giving appropriate levels of flexibility and durability over time. The content of amorphous sugars is 5 to 30% of the total weight of soft candy in solid content conversion, or more desirably 8 to 15%. If the content is less than 5%, the soft candy dough becomes brittle when molding, compromising the molding properties; it also results in a soft candy likely to dry up over time, losing the viscoelastic texture specific to soft candy. Conversely, if the content exceeds 30%, the soft candy dough becomes sticky when molding, making molding difficult, and resulting in a soft candy sticking to packaging materials or sticking to fingers or palate.

[0010] Next, the thickening agent may be selected from: for example, gum arabic, guar gum, locust beam gum, pullulan, gelatin, etc.; they may be used singularly or some of them may

be combined. The thickening agent above is dissolved in water prior to use. The thickening agent, together with the amorphous sugars, forms a continuous layer, where it functions to disperse the crystalline particles of the powder ingredient with their surfaces slightly melted and to bind them with one another. This is effective in giving a soft candy, without heating, the viscoelasticity specific to soft candy, long lasting flavor and texture (chewing), and molding properties (resistance to mechanical stretch, rolling, compression, etc.). The content of the thickening agent is 2 to 8% of the total weight of soft candy in solid content conversion, or more desirably 3 to 5%. If the content is less than 2%, the crystalline particles in the powder ingredient do not bind with one another sufficiently, likely to compromise the molding properties. Conversely, if the content exceeds 8%, the crystalline particles in the powder ingredient bind with one another excessively, likely to reduce the moldability, and the resulting candy, containing a higher level of moisture, becomes stickier, and its durability over time is likely to deteriorate; further, the elasticity of the candy exceeds a desirable level, compromising the moldability. Gelatin and gum arabic are desirable in terms of durability over time, texture, and molding properties; gelatin, giving a pleasant texture while chewing, is especially desirable. Gum arabic is also desirable, giving a pleasant feel when one bites

into a candy. Further, pullulan is desirable, giving a sticky texture and enhancing the pliability of the candy dough when molding, although it is slightly inferior to the others in terms of durability over time.

[0011] The soft candy according to the present invention uses a binding control agent. The binding control agent controls the binding status of the crystalline particles of the powder ingredients achieved by the thickening agent to an appropriate level, and creates a texture rich in smoothness and viscoelasticity specific to soft candy. The binding agent may be selected from: for example, fats (animal fat such as butter, lard, egg oil, etc, vegetable oil such as margarine, cacao butter, nut/seed oil, etc., processed fat such as cacao butter alternative, medium chain triglyceride, etc., or their blended or processed products), emulsifiers (for example, sucrose fatty acid ester, monoglyceride fatty acid ester, propylene glycol fatty acid ester, sorbitan fatty acid ester, lecithin, etc.), glycerin, etc.; they may be used singularly or some of them may be combined. Fats are superior in controlling the binding of powder ingredient, and are especially desirable. Among the fats, hydrogenated vegetable oil is especially desirable in terms of molding properties and durability. It is desirable to use fats having a melting point of around 35°C for a better texture (melting in the mouth). Also, while emulsifiers are limited in

the volume so as not to affect the flavor and are slightly inferior to fats in texture, they are effective in preventing a soft candy from absorbing moisture and from sticking to its packaging, and in improving the durability over time. If fats are used as the binding control agent, the fat content should be 3 to 20% of the entire weight of soft candy, or more desirably 8 to 15%. If emulsifiers are used as the binding control agent, the emulsifier content should be 0.5 to 3%. If the content of the binding control agent is less than the levels above, the crystalline particles in the powder ingredient are bound tightly, failing to provide a soft and smooth texture; conversely, if the content exceeds the levels above, the binding power of the crystalline

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particles in the powder ingredient is reduced; if fats are used, the resulting product is subject to separation, and its moldability often deteriorates. The product may be too oily or marked with a strong odor of the raw ingredients.

[0012] In addition to the ingredients above, optional ingredients may be added to the soft candy according to the present invention; for example, high moisture ingredients such as water, fruit pulp/juice, milk, cream, liquor, essence, beverage solution, etc., and granular ingredients such as jelly chips, chocolate chips, nuts and seeds, dried fruits, granular

reducing palatinose, micro capsule, etc., or these granular ingredients subjected to thermal processing such as coating, etc.

[0013] Next, while the soft candy according to the present invention can be manufactured by combining the ingredients above at once, it is more desirable to follow the steps below. First of all, soft candy dough is prepared. First, the binding control agent (for example, fat) is placed in a kneader. This insures uniform mixing of the other ingredients, and allows the crystalline particles of the powder ingredient to be added next to maintain their shape. If a solid fat is used, it should be melted or cut into fine pieces in advance for uniform mixing.

[0014] Next, the powder ingredient containing crystalline sugars is added to the binding control agent in the kneader, and the resulting product is agitated and mixed. At this point, the mixture is wet since the fat and powder ingredient are absorbed with each other, and is ready to fall apart with a minimal impact although it can be manually held together into a ball.

[0015] Next, the amorphous sugars and the thickening agent are added to the mixture above, and the resulting product is agitated and mixed for approximately 10 to 30 minutes until the crystalline particles in the powder ingredient are slightly melted on the surface. The moisture that slightly melts the surface of crystalline particles is derived from, for example,

the moisture contained in amorphous sugars, the moisture dissolving the thickening agent, etc. At this point, the crystalline particles in the powder ingredient, being slightly melted on the surface, are dispersed in a continuous layer made of the thickening agent and amorphous sugars, and are bound with each other through the thickening agent and binding control agent. The present invention, by providing this specific binding status, offers a soft candy superior in moldability and viscoelasticity, without heating.

[0016] Lastly, emulsifiers, flavoring agents, aroma chemicals, etc., are added as needed, resulting in soft candy dough.

[0017] In the present invention, it is desirable at this point to adjust the moisture level of soft candy to 3 to 13%. If the moisture is less than 3%, the crystalline particles in the powder ingredient cannot be slightly melted on the surface, and the product lacks viscoelasticity specific to soft candy, resulting in dry dough inferior in moldability, texture, and durability over time. Conversely, if the moisture exceeds 13%, the moldability and texture are compromised due to excess stickiness and supernatant water, and the quality is likely to deteriorate while in storage.

[0018] While the soft candy dough according to the present invention is prepared without heating, the dough temperature may rise to 30 to 60°C due to the frictional heat during mixing. To

prevent the product temperature from rising, a double jacket tank can be used as a mixing tank with cooling water circulated in its outer layer.

[0019] The soft candy dough thus obtained is uniform in crystalline structure immediately after the dough is prepared; since it requires no maturing process, it can be transferred to process steps for molding directly, speeding up the manufacturing process. Crystalline particles in the dough are also stable over time.

[0020] Next, the soft candy dough above is molded. For molding, the soft candy dough is pressed out using, for example, an extruder, rolled into ropes by a roller, etc., and molded by stamping or cutting for volume production. A batch former may be used instead of an extruder to form ropes. Also, the soft candy dough prepared by a mixing machine (kneader, etc.) can be immediately rolled into sheets by a rolling machine to be cut into pieces. Any of these methods can be selected as needed.

[0021] Further, as another method, a double axis extruder may be used; in this case, a powder ingredient mixture is supplied from a hopper; the mixture is transferred into a die, where it receives (1) melted fat; (2) thickening agent; and (3) other ingredients in order from multiple feeders of the die, and is continuously mixed; the soft candy is discharged from a die holder without subjected to heating, rolled into ropes by a

roller directly connected to the die holder, and molded by stamping or cutting. Use of the double axis extruder further speeds up the process, allowing for continuous volume production.

[0022] The soft candy according to the present invention can be combined with conventional soft candy subjected to heating, as well as different materials such as hard candy, chewing gum, etc. The soft candy according to the present invention is quite compatible with different materials in texture, and is superior in bonding; the bonding process is easy since the candy requires no strict control of the temperature during production. Also, it allows the ingredients used for the combined product to quickly develop the flavor without compromising their ability and function for flavor. The combined product can be made, for example, in the following manner: in a batch former, the hard candy dough kept at 90°C is placed in the outer chamber, while the soft candy dough kept at 70°C is placed in the center; the mixture is stretched into ropes, and is formed by cutting or stamping; the bonding of these materials is excellent even if they are supplied at different temperature levels.

[0023]

[Effect of the Invention] As discussed above, the soft candy according to the present invention, wherein the particles of the powder ingredient, while being slightly melted on the surface,

are dispersed in a continuous layer containing the thickening agent and the binding control agent, has a smooth and viscoelastic texture specific to soft candy and is superior in moldability despite being subjected to no heating, suitable for various mechanical molding methods used in industrial volume production. Since the candy requires no heating (boiling) or maturing

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process, the candy is free from the variance in crystalline structure, moisture, physical properties, flavor, etc. that is likely to occur at these process steps, allowing for speedy volume production of the candy with uniform quality. Since no heating is involved, the flavors, nutritious values, functions, physical properties, etc. of heat sensitive ingredients are not compromised. Further, the candy does not absorb moisture or dry out in storage for a long period of time, and can be distributed in conventional packaging at room temperature for a long time. The candy, superior in bonding, can be easily combined with different materials such as hard candy, heated soft candy, chewing gum, etc.

[0024] Next, the present invention will be described in detail with reference to embodiments.

<Embodiments 1 to 17, Comparable Examples 1 to 4> Crystalline sugars, rice starch, and bonding control agent were mixed in a

kneader according to each of the compositions shown in Table 1, and amorphous sugars and an aqueous solution of the thickening agent were added, resulting in soft candy dough. Next, the dough was pushed out from an extruder, formed into ropes, and cut into soft candy pieces. Each soft candy sample was tested for texture and durability over time (each sample was stored in "Yamato 1G-45 constant temperature/humidity chamber at 35°C and a humidity of 70% for 3 weeks; the adherence to wrapper and appearance of each candy were tested) by 20 taste testers. The ease of operation in molding was also tested by 2 workers. Tables 1 to 4 show the results.

[0025]

[Table 1]

(Weight Parts)

		Embodiment					
		1	2	3	4	5	6
1)	Sugar	50	60	80 (or 60-TR)	20	43	72
	Sorbitol Powder	10	–	–	–	–	–
2)	Starch Syrup *1 (Solid)	15 (12.75)	15 (12.75)	3 (2.55)	35 (or 38 – TR) (29.75)	35 (or 38 – TR) (29.75)	6 (5.10)
	Reducing Rice Starch *2 (Solid)	–	–	–	–	–	–
3)	Gelatin Solution *3 (Solid)	7 (3.15)	7 (3.15)	7 (3.15)	7 (3.15)	7 (3.15)	7 (3.15)
	Pullulan Solution *4 (Solid)	–	–	–	–	–	–
	Gum Arabic Solution *5 (Solid)	–	–	–	–	–	–
4)	Shortening	15	15	10	15	15	15
	Emulsifier *6	–	–	–	–	–	–
Rice Starch *7		3	3	–	23	–	–
Total		100	100	100	100	100	100
Moisture (%)		6.4	6.4	4.3	11.4	9.1	4.75
5)	Moldability	◎	◎	○	△	△	○
	Texture	◎	◎	△	△	△	△
	Durability	◎	◎	△	×	△	○

1) Crystalline Sugar
2) Amorphous Sugar
3) Thickening Agent

4) Binding Control Agent
5) Evaluation *8

*1 BX85° DE=42
*2 BX70°
*3 BX45°
*4 BX30°
*5 BX30°
*6 Saccharine Ester (Sugar Ester S-770)
*7 Solid 90%
*8 Criteria
◎ Very Good
○ Good
△ Poor
× Very Poor

[0026]

[Table 2]

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(Weight Parts)

		Embodiment					
		7	8	9	10	11	12
1)	Sugar	68	52.5	75	54	55	59
	Sorbitol Powder	10	-	-	10	10	-
2)	Starch Syrup *1 (Solid)	6 (5.10)	15 (12.75)	15 (12.75)	13 (11.05)	13 (11.05)	13 (11.05)
	Reducing Rice Starch *2 (Solid)	6 (4.20)	-	-	-	-	-
3)	Gelatin Solution *3 (Solid)	7 (3.15)	17.5 (7.88)	7 (3.15)	-	-	8 (3.60)
	Pullulan Solution *4 (Solid)	-	-	-	8 (2.40)	-	-
	Gum Arabic Solution *5 (Solid)	-	-	-	-	7 (2.10)	-
4)	Shortening	15	15	3	15	15	20
	Emulsifier *6	-	-	-	-	-	-
Rice Starch *7		3	3	-	23	-	-
Total		100	100	100	100	100	100
Moisture (%)		6.55	11.9	6.1	7.55	6.85	6.35
5)	Moldability	◎	△	○	◎	○	○
	Texture	◎	△	○	◎	○	◎
	Durability	◎	△	△	○	○	◎

1) Crystalline Sugar
2) Amorphous Sugar
3) Thickening Agent

4) Binding Control Agent
5) Evaluation *8

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*2 BX70°
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*4 BX30°
*5 BX30°
*6 Saccharine Ester (Sugar Ester S-770)
*7 Solid 90%
*8 Criteria
◎ Very Good
○ Good
△ Poor
× Very Poor

[0027]

[Table 3]

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(Weight Parts)

		Embodiment				
		13	14	15	16	17
1)	Sugar	69.5	72	20	36	49.5
	Sorbitol Powder	10	–	–	–	27
2)	Starch Syrup*1 (Solid)	15 (12.75)	15 (12.75)	35 (29.75)	37 (31.45)	3 (2.55)
	Reducing Rice Starch *2 (Solid)	–	–	–	–	–
3)	Gelatin Solution *3 (Solid)	7 (3.15)	7 (3.15)	7 (3.15)	7 (3.15)	5.5 (2.47)
	Pullulan Solution *4 (Solid)	–	–	–	–	–
	Gum Arabic Solution *5 (Solid)	–	–	–	–	–
4)	Shortening	8	3	15	15	15
	Emulsifier *6	0.5	3	1	–	–
Rice Starch *7		–	–	22	–	–
Total		100	100	100	100	100
Moisture (%)		6.1	6.1	11.3	12.9	3.48
5)	Moldability	◎	◎	△	△	○
	Texture	○	△	△	○	△
	Durability	◎	◎	○	△	△

1) Crystalline Sugar
2) Amorphous Sugar
3) Thickening Agent
4) Binding Control Agent

5) Evaluation *8

*1 BX85° DE=42
*2 BX70°
*3 BX45°
*4 BX30°
*5 BX30°
*6 Saccharine Ester (Sugar Ester S-770)
*7 Solid 90%
*8 Criteria
◎ Very Good
○ Good
△ Poor
× Very Poor

[0028]

[Table 4]

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(Weight Parts)

		Comparative Example			
		1	2	3	4
1)	Sugar	–	58	55	68
	Sorbitol Powder	–	20	–	10
2)	Starch Syrup *1 (Solid)	48 (40.80)	–	30 (25.50)	15 (12.75)
	Reducing Rice Starch *2 (Solid)	–	–	–	–
3)	Pullulan Solution *3 (Solid)	–	–	–	–
	Gelatin Solution *4 (Solid)	7 (3.15)	7 (3.15)	–	7 (3.15)
	Gum Arabic Solution *5 (Solid)	–	–	–	–
4)	Shortening	15	15	15	–
	Emulsifier *6	–	–	–	–
Rice Starch *7		30		–	–
Total		100	100	100	100
Moisture (%)		11.4	3.9	4.5	6.1
5)	Moldability	×	×	×	△
	Texture	×	×	×	×
	Durability	×	×	△	×

1) Crystalline Sugar
2) Amorphous Sugar
3) Thickening Agent
4) Binding Control Agent
5) Evaluation *8

*1 BX85° DE=42
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*6 Saccharine Ester (Sugar Ester S-770)
*7 Solid 90%
*8 Criteria
◎ Very Good
○ Good
△ Poor
× Very Poor

[0029] As the results demonstrate, the samples of the embodiments were superior in moldability, texture, and durability over time, having a desirable texture as soft candy despite being subjected to ho heating. Embodiments 1 and 2 were especially good; embodiment 1 had a viscoelastic texture, while embodiment 2 had a smooth, moist texture. Meanwhile, the comparative examples were inferior in moldability, texture, or durability over time, and were not desirable.